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Automation

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There is probably no topic more discussed in industry today than automation, and I doubt if there is any that is more misunderstood. It is rather surprising how often the layman is inclined to let his imagination supply many answers, both possible and impossible, thus creating his own conception of science fiction.

Automation, contrary to popular belief, is not just a collection of instruments or control gadgets to be used in a regular process. Automation is a concept. It appears in many forms, and in some cases its identity is nearly lost because it seems the natural or economic thing to do in a particular process. The word "automation" is a new word denoting automatic operation, and the process of making things automatic. The origin of the word is humble, indeed. John Diebold, editor and associated publisher of *Automatic Control* magazine, in writing an article for the *Harvard Review,* found the word "automatization" both awkward to pronounce and difficult to spell, so he coined the new word. Mr. D. S. Harder, Vice-President in Charge of Manufacturing of the Ford Motor Company, is also credited with having used the word for some time to describe the automatic handling of materials and parts in and out of machines. In any event, the new word has given a terrific boost to the field of automatic control. Automation is somewhat of a hypnotic catchphrase, similar to past expressions such as "mechanical", "assembly line", "electrical", "technology" and "electronics." We should not lose sight of the fact that changing names from time to time doesn't alter the aim of "accomplishment with least effort."

When we hear references to automation, it is well to remember that we have some good examples of it around us every day. In our homes we have: alarm radios, record players with automatic changers, thermostats for cook stoves and furnaces, and air-conditioners. Outside our homes: the street lights come on and go off automatically at a certain time each day; electric traffic signals are operated automatically; radar-controlled speed enforcement systems are in effect. In business buildings, we accept as standard equipment such things as automatic elevators, automatic fire control sprinkler systems and burglar-alarm systems. The "electric eye" door-opener at many super-markets is no longer a novelty.

General Business Application

Many of the recent advancements in the field of automation have been made possible by electronic tubes. Television—probably the most widely known electronic device—is currently being used and developed for business purposes. Banks on the west coast are using television between branch and home offices to verify customer signatures. Some prisons are using TV as an automatic monitor to help guards and others to keep tab on what's happening throughout the prison. You are probably familiar with the automatic, electronic telephone-answering devices. The completion of a long-distance telephone call through straight dialing is also an electronics-inspired innovation.

The oil industry has readily recognized and generally accepted automation as a logical advancement in the use of automatic controls. In a modern pipe line system, one man, sitting in a small control room, directs the flow of millions of barrels of crude oil and products. Without moving from his chair, he can punch appropriate buttons to cut off a stream of oil, or re-route its flow. An oil refinery is probably the best example of automation in the industry. Crude oil is received through a pipe line and its flow through the refinery is directed by pre-set controls. Operating conditions are likewise automatically controlled, and final delivery of the finished product—perhaps even packaged—is accomplished with little or no direct manual handling.

Automation's Impact

My purpose in stressing these examples is to emphasize that the electronic tube has paved the way for a series of new developments in automation. While its possibilities are far-reaching, it couldn't be as far-reaching as some of the fantasies it has hatched. I am reminded of the recently popular New York stage play "The Desk Set," starring Shirley Booth. The theme of this play deals with an "electronic brain" that is installed in an office over the weekend, and its acceptance by the people it is to replace. The reason the theme of the play is not

considered too far-fetched might be attributable in part to the "magic brain" publicity accorded Remington-Rand's Univac computer during the presidential election of 1952. You will recall the Univac predicted an Eisenhower landslide while political commentators doubted there would be anything like a landslide. As a result of its prediction, Univac was hailed as something akin to the supernatural.

Congress has explored automation's impact. With a Congressional Committee as the nation's sounding-board and automation as the motivating factor, labor leaders and industry experts openly aired the whole field of automation. Although no immediate conclusions can be drawn from their testimony, it is quite likely that an important achievement will be the separation of fact from fiction. Obviously, of primary concern are the matters relating to probable displacement of personnel, stability, and growth of the nation's economy. Labor leaders and industry recognize that automation is here to stay and that its effect on people depends to a large degree on the speed of its development and the opportunities for relocating displaced personnel.

Office Automation

As accountants, you are vitally interested in the role of automation in business offices, particularly accounting. Our scientific laboratories' greatest contribution to office equipment in recent years has been the introduction of the electronic principle. The substitution of vacuum tubes for the usual gears, wheels and moving parts will have far-reaching effects. These tubes can transmit and hold information in electric impulse form and carry out arithmetical functions faster than mechanical equipment. The field of electronic equipment is a tremendously complex and rapidly changing field, and has been referred to as a revolutionary idea. I prefer to think of it as an evolutionary process. To illustrate, let's go back in our memories to the player piano. You remember it made music when air was pumped through the holes punched in the music roll. The old piano roll combined with electric current and the typewriter became the basic feature of our modern automatic typewriters. The punched card machines likewise use an electrical impulse through a hole in a card. The present-day electronic computer, an integral part of so-called electronic accounting equipment, was initially designed for engineering, mathematical and scientific computations. Without it the atomic bomb and guided missiles would have been delayed many years. Since there is a limited market for the equipment in these particular areas, the manufacturers of the computers looked for additional markets.

Because accounting involves the processing of considerable data, the manufacturers looked here for possible business applications of their equipment. There are now ten or more manufacturers of electronic data processing equipment which can handle various phases of accounting operations.

One problem facing the manufacturers as they strive to expand their market is that the computer—the core unit of electronic data processors—was designed to make complex computations and arrive at a relatively short answer. In contrast to this, accounting generally involves simpler mathematical computations and voluminous source information, plus an output of detailed printed information. Because of this, computers built for scientific work have had limited use in accounting.

Another market-limiting factor is cost. The cost of this equipment has been so great that only a few very large organizations have found it feasible or economical. Manufacturers of the equipment have posted rental fees ranging from $6,500 to $27,000 monthly and selling prices of from about $175,000 to more than $1 million. The variations in prices and in rentals presumably represent the differences in versatility of the equipment.

The primary justification for bringing electronic equipment into the business office depends upon economic factors. To this end, the manufacturers are directing their attention toward producing low-cost electronic equipment which the average and small size business needs and could use. How long it will take them to achieve this objective is anybody's guess.

New Characteristics

As yet there are few real experts in the field of office automation—so beware of those who profess to be. Most of the numerous technical differences which distinguish electronic equipment from all prior types of mechanical office machines are significant only to the engineer. Accountants and office administrators should be concerned with the methods and the end results. From an operating viewpoint, there are two major characteristics of this equipment which are quite new.

Follow through—The most important of these new characteristics is the ability of electronic equipment to go through a series of operations in sequence without the help

of a human operation to guide it through each step in a particular process or computation. For example, in one continuous operation, a more or less standardized set of electronic equipment can:

1. Figure the regular pay of employees, add any overtime, and extend the gross pay.
2. Compute and deduct withholding tax, social security tax (if any), and then subtract any voluntary payroll deductions.
3. Punch cards for preparing payroll checks.
4. Determine new balances of employee savings bond accounts and indicate bonds to be purchased.
5. Develop new year-to-date figures.

Obviously, to perform this under a manual system requires human motivation for each step, whereas the electronic follow-through characteristic makes it possible to automatically perform each function step-wise to arrive at the end result.

High speed—The second distinguishing characteristic of electronic equipment is its high speed of operation. Perhaps too much has been written about this particular feature, although it is the fastest automatic equipment yet developed. Many operations which manually have required days or weeks can now be performed in a matter of minutes or hours.

Mechanical Brain Idea

We've heard quite a bit of hocus-pocus about electronic equipment being endowed with a magical brain. This expression has probably done more to publicize and stimulate advancement in office automation than anything else. Some of the mysticism probably arises from hearing or reading such expressions as: The equipment "receives instructions," "is told" what to do—that it has a "memory drum" and can "think." Obviously, these expressions personify an inanimate object. They are used merely because electronic equipment can be adapted to perform a sequence of operations which heretofore only the human mind could handle.

Overly simplified, here is what those expressions refer to: Someone—say the accountant—makes an outline of the data needed and the steps involved to arrive at the end result. Such an outline, with appropriate explanations, is then given to an electronics technician familiar with a given brand of equipment to be used. The technician adjusts the equipment so that it can process the data. The combined work of the accountant and the technician is frequently called "programming."

Nomenclature

Perhaps it will be more informative and helpful in understanding a complex subject if we drop anchor at this point and discuss some of the basic features of electronic equipment: (1) an input device, (2) a storage system, (3) an electronic computer, (4) a control unit, and (5) an output unit.

As with any other mechanical system, an electronic data-processing system must have a method whereby the original data is transferred in a form the system can handle. This is accomplished by an input device which might be actuated by a deck of tabulating cards, but is probably a manually operated keyboard. Connected to this keyboard is a mechanism which receives the coded data and transcribes it on tapes or cards. (Magnetized plastic tapes are by far the fastest medium for the system to handle.)

Data received from the input device is stored until the computer is ready for it. By using cathode ray tubes (similar to TV picture tubes), magnetized drums (or cylinders) and magnetized tape, it is possible to retain a mass of information. With this built-in storage, it isn't necessary to provide for temporary filing, separate cross-references and other manual handling. The system also stores instructions which specify: what the machine should do; where it will find the data to be processed; where it will find the next instruction. Hence the expression, "memory unit."

The heart of the electronic data-processing system is its central processing unit—the computer. It is the monster that makes the electronic system unique. As needed during the processing routine, the computer receives data and instructions; directs them into and calls them out of the storage unit. It performs the arithmetical operations of addition, subtraction, multiplication and division, and has the further ability (found only in a limited degree in mechanical systems) to make comparisons between numbers or other characters and to take the action called for by the result. It also directs the processing operations within itself and controls the flow of inbound and outbound information. This is the "Brain" or point at which decisions are made. All these functions can be performed with fantastic speed.

Since I referred to the computer as the heart of the electronic data-processing system, then the control unit might be called the nerve center. By observing control signals and manipulating various control keys, one person can direct the entire operation

of the system. That is—after the process has been thoroughly "programmed" and "debugged."

The final stage in processing is writing out the results. This can be done in readable report form, or can be stored on a tape or card for future use. If a printed report is desired, a printing mechanism will receive the electronic signals and translate the code into numbers and letters in the prescribed format.

Why automate?

We are living in a marvelous age. It is getting to be more and more an electronic age. It has been said that as far as the future is concerned, not even atomic energy overshadows electronics. Let's bring our discussion a little closer to home. As accountants, you are wondering how all this "automation" and "electronics" affects your offices.

We have all seen the evolution from pick-and-shovel methods of ditch-digging to the use of automatic ditch-digging equipment. Why was this done? Basically, it was motivated by economic factors. Bringing automation or electronic equipment into your business office likewise depends, to a large degree, on economic factors. However, as in the ditch-digging example, there are other inherent advantages that should be considered; more flexibility for enlarging the scope of information needed by your management; expansion of operations without corresponding increases in personnel; earlier availability of results; shifting of laborious and repetitive tasks to mechanical devices, thus overcoming some of the limitations and undesirable features of a manual system. The industrial giants are now triggering around trying to adapt and "de-bug" accounting procedures to fit electronic equipment; while the manufacturers of such equipment are predicting when it will be economical for small companies to start using it. Does this mean that smaller companies should wait and do nothing until electronics are marketed in economy-sized packages?

No, nor am I suggesting that each of you establish electronics as your goal. It is not the answer to all your problems. I believe that all companies, large and small, owe it to themselves and to their future to keep abreast of the developments that are being made in the field of office improvements and to take advantage of them as they become practical for their own particular situation. You cannot sit back and await the arrival of new developments and improvements in office techniques and equipment, pick them off, and immediately put them to work in your business. Each individual company and each problem is different. The answer in each case will be the result of individual study which can be started now and completed over a period of time.

Course of Action

Problems have a way of getting solved when someone begins to think about them; thinking produces ideas and stimulates imagination. Investigating the usefulness of ideas is a basic form of research and has never been reserved for professional researchers who have large sums of money for experiments. Without research or investigation on the individual office level, many of us would never know whether we could use the products made possible by the million-dollar type of research.

Accountants on all levels of responsibility would do themselves, their companies and their profession a valuable service if they spent more time and effort improving and modernizing their present accounting plant. Modernization and improvement begin with efficient procedures and may or may not proceed to elaborate electronic-brain type equipment. The degree of automation is not itself a measure of accounting efficiency—a grossly inefficient accounting system can have considerable automation.

Drawing on my personal experience and from the work I am currently doing in the field of electronics and mathematical techniques, I offer certain observations which may be contradictory to some of the published comments you've read.

The transition to electronics should not be from manual methods directly to electronic data processing equipment. Converting to punched cards first will largely achieve any contemplated savings. The machine limitations and demands imposed by punched card procedures will flush out many of the weaknesses of basic records and routines. Without such conditioning, a transition from manual methods to electronic data processing machines can result in a chaotic condition. Don't run pell-mell from manual methods to the complex data processing systems.

Develop a healthy attitude toward improving your office procedures. Take time to study and revise what you are doing, even though you consider your present system adequate. I would like to particularly stress the word *attitude*. In *Spiritual and Moral Values in Business*, Professor Erwin H. Schell of M.I.T. said, "When our attitude is

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A shortage in inventory led to investigation that turned up the following facts: The manager was authorized to purchase grain at prices set by the company and all shipments had to be by order of the home office. For reasons of simplicity inventories were only taken when the quantities were low. Our friend, the manager, had operated in this manner—he approached a number of farmers with the offer, purportedly from the company, that if they would accept a 90-day note in payment for the grain they would get 5c more a bushel. Many accepted the proposition and proceeded to issue the notes on the "Company." It was found that much of this grain was taken in as cash purchases on the books with abstractions of cash following. Also it was later discovered that the manager was selling direct to some itinerant truckers that happened by on a cast-and-carry basis and pocketing the proceeds.

This was a unique case since it involved notes payable, something rather new in the field of fraud. The whole thing was really possible because in the eyes of the local people the manager *was* the Company and they were all friendly with him and trusted him.

In concluding, it would be well to point out that internal control is not in itself an end product, but merely a means toward a desirable end—namely a profitable operation. Like all other elements of a business enterprise, it is valued almost solely on its contribution toward the final net profit.

It has been said that if enough time and effort are spent and enough records kept that any accounting record can be balanced out perfectly. The mere fact that such perfection is possible often leads us to the erroneous conclusion that it is both desirable and necessary.

Finally, if there is anything to be gained from a discussion of internal control it should be that in order to establish an effective system you need more than just technical knowledge and training. Without a sense of relative values, a feeling for the welfare of the business and an understanding of how people work and think you are very likely doomed to failure before you even start.

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right, our abilities reach a maximum of effectiveness and good results inevitably follow." A most significant quotation, and appropriate under most any circumstance. Remember it, and apply it to your own situations.

Acquire a good knowledge of what you are doing; then go about acquiring a broader knowledge and background of methods and equipment available to small and large business offices. Visit other business establishments; attend appropriate courses of instruction, conferences and conventions. Form study groups and meet with fellow accountants for the mutual exchange of ideas. Utilize experienced methods people, accounting firms or consultants, and establish contacts with equipment company personnel who are always eager to explain possible applications of their type of equipment.

Train your staff to think in terms of simplified procedures. Encourage them to broaden their knowledge by providing opportunities for specialized training and job experience. Equipment manufacturers have set up various types of instruction courses beamed at teaching operators as well as those responsible for directing the work of others. Utilize this means of not only educating yourselves but also your employees and fellow-workers. Make your job easier by developing the skills and experience of as many of the people in your office as you can conscientiously justify.

The time for positive action toward improving your situation is now. Systems work is always easier to defer for good and valid reasons, and is usually done only as a result of necessity. Have you continued to use the same accounting procedures and equipment? Have you handled additional work loads by working faster or possibly adding more people? Sooner or later you are faced with a systems problem, as a result of expansion or retrenchment. The easiest way to approach such a problem is to exercise your best foresight and do some real forward planning. Delivery schedules on most equipment require time, possibly up to as much as one or two years. Pre-installation plans and the work of converting to a new or revised system also require time. It is not uncommon for accountants and office administrators to initiate a change for one, two or three years in the future. If you accept existing situations unquestionably, or wait for someone to hand you an improvement, you may have a long wait, as well as miss the pleasure of professional achievement.

You are all cognizant of the improvements that have been made, not only in the office equipment available to us today but also in the ways of doing things. I leave with you this thought, the basic problem confronting accountants is the same as it was fifty years ago. The accounting pattern is still one of debits and credits; invoices

are still rendered and financial-operating statements are prepared periodically. What is needed is a new look at the problem, a new approach for supplying the information management needs to operate the business. Electronics or some form of mathematical techniques may change the old accounting patterns.

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Budget. The net excess or deficit is shown and compared with the Budget and is of minor importance unless it is spectacularly out of line. Cash on hand or in the bank is included at the bottom of the page. This is the only answer many want to know.

The Funds are reported on individually as to receipts, disbursements, and balance on hand. Typical funds are: Library Fund, Memorial Fund, Organ Fund, Printed Sermon Fund, Building Fund, etc. The interest and enthusiasm in these Funds vary with the attention given them. Currently, we are engaged in a Building Fund to build a new sanctuary. Our goal is $175,000. Most of this is pledged and should be in within three years, but you can be sure that every member, both young and old, is interested in the Building Fund report.

Youth has its own budget and set of books. However, all receipts, youth or otherwise go to the church first. Then a portion of the church budget is returned to the Youth for their Youth Budget.

The Benevolence of the church has its own budget and treasurer and is controlled by the Session. The Church Treasurer receives this money, separates it as best she can from the current expense receipts, and deposits it in the Benevolence Account for the Benevolence Treasurer to disburse. If a donation is marked, it must be restricted for that purpose without exception. Money given for Benevolence use must be spent outside our own church. It is used for Missions, both foreign and home, Radio and Television, Seminary Education, Pensions and a score of needs beyond the local church.

The Property Account is most important as an historical record. It contains the cost of all Assets purchased. It is valuable in case a loan is to be obtained at the bank. It is helpful in fixing the amount of insurance needed. One is amazed to see how even the personal property in a church adds up. The account adds to the continuity of the church's progress over a long period of time.

Very few people in a church can remember all the assets or know about all the Funds. Therefore, it is important to prepare and have available a consolidated Balance Sheet of the church as a single Corporation. It should show the total Cash in the Bank, then in various columns, Cash for: Current Expenses, Youth Budget, Benevolence, Restricted, etc. It should list all of the different bank accounts: checking, savings, etc. It should list securities and properties held. As for Liabilities, it is important that the Boards know exactly how much is owing. Moneys held for special Funds and given for one purpose only, are shown as Restricted Surplus. And for the accountant, it assures her that when all the funds and reports are dovetailed together, her books are in balance and that they record the financial matters of one unit, her Church.

Church Accounting is complicated and important. Every nickel needs to be accounted for. In this day of growing church membership, the church needs the accountant more than ever before. It is a challenge worth accepting, and in the words of Barnstable Patriot, "Use the talents you possess, for the woods would be very silent if no bird sang except the best."

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ASWA, the California Society of CPA's, the Woman's Bar Association of Illinois, and the Business and Professional Women's Clubs, Los Angeles. She is currently serving as member and secretary, Taxation Committee, Los Angeles chapter, California Society of CPA's.

THIS IS IT: LAST CALL TO CONVENTION!

The hearty hospitality that abounds in the Pacific Northwest is fully primed to spend itself in your interests when scenic Seattle greets you September 20-23 at the Annual Meeting of ASWA and AWSCPA.

A "must" to be remembered is the pre-convention salt water boat trip and salmon barbecue Wednesday, September 19.

Extra registration forms are available from Chapter Presidents.

CPA's who plan to remain for the AIA convention, September 23-27, may have their room reservations continued and cleared thru the AIA housing committee by promptly notifying Marguerite Gibb, CPA, 712 Securities Bldg., Seattle 1.